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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	BENSON et al.	Examiner:	JASON M. GREENE
Serial No.:	09/871,156	Group Art Unit:	1724
Filed:	05/31/2001	Docket No.:	758.1226US01
Title:	FILTER STRUCTURE WITH TWO OR MORE LAYERS OF FINE FIBER HAVING EXTENDED USEFUL SERVICE LIFE		

SUPPLEMENTAL DECLARATION OF DOUGLAS G. CROFOOT

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

1. In my original Crofoot Declaration, listed on the IDS in the case, I alleged facts that show that any distribution of filters having fine fiber containing media was an experimental use and not in commercial use or on sale under 35 U.S.C. § 102. The purpose of our activities through April of 1999 was to show that a new fine fiber material could be synthesized, spun, manufactured into filter and successfully used in a harsh environment. While I was not present at the Office Interview conducted on 11 September 2002 between Applicants' attorney, Mr. Jason Greene and Mr. David Simmons, I understand questions were asked about additional facts that can illuminate these issues. The purpose of this Declaration is to provide these facts.

2. In summary, as part of its ongoing fine fiber development project, Donaldson Company, Inc. began a project to improve its fine fiber materials in 1994 (Attachment 1). From 1994 through 2000, the chemistry and polymer production technology were developed.[1] A small amount of polymer was accumulated and used in a trial to ensure that the polymer material could be spun into fiber, the fiber was introduced on to filter media and manufactured into a filter structure in April of 1999. Manufacturing trials of March and April 1999, proved that the material could be successfully spun into fiber, formed into pleated media and assembled into a filter. The cost of the fiber polymer was paid for by Research and Development and was not passed to the user. All of this activity was conducted either in secret using Company facilities or

[1] Commercial production of the polymer did not begin until September of 2000.

with users having a confidentiality obligation with Donaldson Company, Inc. These trials constituted a small proportion of Donaldson Company, Inc.'s overall manufacturing output of fine fiber containing filters (less than 10%).

3. Once these initial manufacturing trials had been completed and technology was shown to be effective in filter manufacture, a final field trial of the filter under actual use conditions was required before the polymer material could be approved for commercial use in which new polymer is used in a plant trial and a field trial. The trial filters have a unique number for tracking purposes in the trials (Attachment 2). Sufficient filters were made in the experimental manufacturing trials for the field testing and were distributed to testing sites, in May and June of 1999, as a part of the users requirements. Production records were kept of the trial units to track the units during the trial. Specific testing sites were selected to expose the filters to varying types of particulate and varying conditions of temperature and humidity in order to prove that the filters could survive in these environments and were superior to previous filter structures.[2] The trial filters were installed in actual use environments. The tests were conducted with one set of filters for a period required to develop good data. The experimental units were proven to be effective filters having properties and product lifetime superior to its predecessor product. One trial occurred that consumed all experimental units. These test methods and product trials are common in the industry and are not unique to Donaldson Company, Inc. Once this successful trial was completed, no further polymer or filters were made commercially until the material was qualified for commercial release in September 2000. Donaldson Company, Inc. did not have a reliable source of polymer until mid 2000. The material was not considered ready for patenting until the material was proved to be successful under harsh conditions.

4. In somewhat greater detail, Donaldson Company, Inc. pioneered the use of fine fiber material on filter media. The previous fine fiber polymer material, that for the purpose of this Declaration will be designated as "old polymer" (shown in the Kahlbaugh reference, Attachment 3) was found to be useful in many applications but suffered from the problem that very small diameter fine fiber materials was subject to substantial deterioration caused by

[2] final analysis, laboratory experimental comparison testing can only rank filter structures tested. The procedures cannot predict, with any degree of confidence, the performance of the filter in the actual use environment.

heat and humidity. When used in environments with a relatively high temperature (greater than 25°C with high humidity, typically greater than about 70% RH), the fiber deteriorated rapidly. Once the fiber was deteriorated by heat and humidity, it provided essentially no filtration properties to media using that fiber. The material essentially "disappeared" on the substrate material and could not be found with microscopic inspection. Because of the serious problems relating to old polymer, an experimental effort was begun as early as 1994 to develop a replacement polymer, that for the purpose of this Declaration will be designated as "new polymer". The new polymer was intended to exhibit increase lifetime in harsh environments.

5. The compositional identity of new polymer was identified and laboratory trials began in a laboratory to synthesize quantities of the polymer to determine its filtration properties in laboratory experimentation. From December 1994 through April 1995, the manufacturing technique for making the material was developed and material was accumulated for use in research and development programs in which the fiber was combined with filter media and used to test the filtration properties and conditions of use for the polymer material in the laboratory. At this time a bench scale manufacturing process was established.

6. From mid 1994 through April of 1999, laboratory scale synthesis of new polymer was conducted to prove the synthetic method and to accumulate polymer.

7. In August of 1999, experiments were conducted to scale up laboratory scale synthesis to production scale. A number of failures to manufacture materials occurred from January of 1999 through November of 1999 (Attachment 4). A number of product problems were seen in these batches. The first successful large-scale manufacture of the material, new polymer, was made in June of 2000. No successful commercial production of material was made prior to the June 2000 manufacturing run. In September of 2000, the polymer was approved for commercial use (Attachment 5).

8. Once the polymer formulation and polymer manufacturing techniques were developed at the laboratory scale, the processability of the new polymer material required demonstration. The experimental materials accumulated through March 1999 were then electrospun in experimental trials into a fine fiber layer on conventional media material at a Donaldson Company, Inc. facility (Attachment 2). In this trial, the cost of the polymer material

was paid for by research and development. The cost of the new polymer was not passed on to any user. The filters were labeled uniquely to identify the test units for control of the experimental trial.

9. Once the new polymer material had been confirmed as suitable for electrospinning into a fine fiber layer, then the resulting media containing the new polymer fine fiber layer required an experimental production trial to ensure that the fine fiber media material could be placed into production equipment and pleated.

10. Once the pleated media with new polymer fiber was successfully manufactured, an experimental trial was conducted to show the media could be made into a filter using liner material, end caps, potting compounds and other components of commercial filtration manufacture (Attachment 6). The special manufacturing trial was approved in December of 1998 and occurred in April of 1999 by temporarily deviating production to filters containing new polymer material.

11. The spinning trials and pleating trials were conducted in April of 1999 in a ~~Client~~ company facility ~~under the provisions of a confidentiality agreement~~, while the filter manufacturing trials were conducted by Donaldson in April of 1999.

12. The amount of new polymer and the number of filter units made were a relatively small proportion of typical production. The amounts produced were the minimum required to conduct the field trials. In fiscal year 1999, Donaldson made approximately 1,000,000 pounds of media. Less than 15,000 pounds of media contained the new polymer/fine fiber. In the second quarter of 1999, about 20,000 individual fine fiber filter units were made of which less than about 3,000 filters were made using new polymer fine fiber.

13. In summary, the intent of those conducting the experimental manufacture of the polymer, experimental spinning of the polymer into a fine fiber web and the experimental trial of the resulting substrate into a filter unit was solely to ensure that the material was suitable for use in filter manufacture and that the resulting 3,000 units would, in fact, survive the harsh environments into which these units were placed. The field test was conducted under known and controlled use conditions and the test filters were identified to establish control over returned

filter. The trial filters were considered to have successfully passed the field trials in November of 1999 (Attachment 7).

14. The filter technology tested in this initial experimental trial of filter cartridges involved the filtration of intake air in large power generating stations. In such stations, large numbers of filters are arranged in banks and large volumes of air at high rates of flow are filtered of small particulate to protect turbine plates from erosion. The numbers of units shipped were required to obtain useful data (Attachment 8). The records show that the filters required evaluation and user acceptance.

15. Prior to the manufacturing trial, only conventional filters were manufactured during the time frame of January through April of 1999. After the limited manufacturing trial run was completed, commercial manufacture returned to the conventional filters until later 2000.

16. Specific test sites were selected to obtain valuable data of use at specific conditions of temperature, humidity and particulate type. These sites were selected because they were known to monitor performance on a minute-to-minute time frame. The user continually maintained control and monitoring of the elements. Filter failure would be instantly seen in increase pressure drop or reduced airflow. The test sites were not publicly accessible. Approximately 1,500 installed generators use a relatively large number (300-500) of filter units per turbine generating station. In this experiment, it is critical that each installation of 300+ filters used identical filters, otherwise the experiment would not yield useful data if a small percentage of the filters would suffer problems, it might not be noticed. If all filters in an installation suffered problems, the operators would notice the increased pressure, reduced efficiency or difficulty in pulse cleaning without suffering any ambiguous results. Accordingly, to obtain reliable data, from five sites, a relatively large production run (less than 3000 units) was required to get reliable data. Fewer units would not have obtained reliable results because of the requirement to install large numbers of filters per installation. In November of 1999, the results of the trials were reviewed and production was planned for release in September of 2000 (Attachment 7).

17. The capital investment in each power generator is approximately $8,000,000. Down time, as a result of inability to operate, can cost as much as $3,000 per minute.

Accordingly, power installations are understandably reluctant to experiment with any aspect of operations. In order to validly test the new polymer containing filters, the users were not informed that an experiment was being conducted, however, the users having the experimental units were known to Donaldson Company, Inc. personnel who were sensitive to any problem at the user end and to any returned filter unit.

18. After the trial run, no additional experimental units were made for nearly a year.

19. In light of the fact that the fine fiber is a difficult to detect material on a substrate background which is pleated and then placed into an expanded metal shell, the invention cannot be readily detected simply by inspection of an assembled unit. The nature of the fine fiber can only be clearly understood by disassembling the structure and examining the substrate under high magnification, preferably scanning electron microscopy conditions.

20. The conditions of the manufacturing trial and experimental installation of the filter units required substantially increased cost to Donaldson Company, Inc. for the manufacture of the fine fiber containing substrate, pleating the substrate and assembling the filters. The conventional Donaldson Company, Inc. developmental policy involved determining a need in the market requiring newly developed filter technology. That need for technology is typically reflected in the research and development program for the purpose of developing novel technology to solve the initial problems. Often, parallel projects are conducted to obtain a variety of solutions for the need. Each solution is laboratory tested until optimized and from the optimized solutions, one solution is selected for manufacturing trial and initial experimental use placement. If the products appear to operate well in the operating environment, then, based on a combination of further laboratory analysis, cost analysis, marketing input, a decision may be made to place the newly developed technology into regular marketing stream of commerce. This is a typical development profile that was substantially adhered to in the development and release of the units in question.

21. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such false statements may jeopardize the validity of the application or any patent issued thereon.

11/12/2002
Date:

Douglas G. Crofoot

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